Field Review of the Draft K-12 Grade Span Expectations (GSEs) in Science

Rhode Island Grade Span Expectations K-12 in Science Review – High School

Please Note:

Field Review input needs to be returned to RIDE by Thursday, December 1, 2005.

Please return completed information to:

Pat Kozaczka RI Department of Education Office of Instruction 255 Westminster Street Providence, RI 02903 FAX: 401-222-6033

FAX: 401-222-6033 Pat.Kozaczka@ride.ri.gov **NOTE:** You may submit a compilation of comments by attachment electronically to Peter McLaren at peter.mclaren@ride.ri.gov

Any questions regarding Field Review process may be directed to Peter McLaren (Peter.McLaren@ride.ri.gov) at 222-8454 or Linda A. Jzyk (Linda.Jzyk@ride.ri.gov) at 222-8473.

Field Review of the Draft K-12 Grade Span Expectations (GSEs) in Science

Directions:

- 1) Begin the review process using the field review packet that most closely aligns with the grade level(s) with which you are most familiar. There are three review packets based upon the grade spans that will be used for large-scale assessment (K-4, 5-8, & high school).
- 2) Complete the Reviewer Information form found on page 2.
- 3) Read in the GSE packet "About the Draft Rhode Island K-12 Grade Span Expectations in Science: to understand how the draft science GSEs were developed and to familiarize yourself with the format of the document and the relationships between the Statements of Enduring Knowledge (EK), the state Assessment Targets, the Unifying Themes, the cross-grade span Stems and the GSEs.
- 4) Review **Appendix A: GSE Development in Science** for greater understanding of the nature of the science GSEs including the criteria for their design.
- 5) Read the following questions which form the basis for this field review document:

Question 1: Is the GSE articulated in a way that it is clear what is expected of classroom instruction/curriculum and state assessment?

Question 2: Are the differences between the GSEs of adjacent grade spans clear? They should show the appropriate developmental growth as they progress K - high school.

Question 3: Is the GSE more rigorous, similar to, or less rigorous than what is presently expected in your school's science program at that grade span?

Question 4: Does the set of GSEs within each Statement of Enduring Knowledge have the potential to promote coherent instruction? First, is each individual GSE coherent with the Statement of Enduring Knowledge under which it is listed? Second, as a whole, do these GSEs articulate well-balanced coverage of the major concepts within the EK statement? How could they be improved?

Question 5: What science content (important concepts) is missing in these draft science GSEs? Where are there gaps in content? This information is most essential for developing the science GSEs for local curriculum, instruction and assessment.

- 6) Locate the grade span you are reviewing in the GSE document. Notice that the GSEs listed in the review packet are detailed, in order, by domain, then by Statement of Enduring Knowledge, and finally by the corresponding assessment target. To help specify the GSE on the review packet, the initial portion of the GSE as listed in the GSE document, has been written next to the GSE number in the review packet.
- 7) Work through questions 1, 2, and 3 for each GSE within that grade span. Then answer question 4 about the set of GSEs within the Statements of Enduring Knowledge. Notice there is a place to code a response to each question and a place to provide comments.

Rhode Island K-12 Grade Span Expectations in Science – Field Review Reviewer Information

Name	
District/Organization	
School	or Other
Position:	
Grade level and or course(s) you are teaching	
Number of years in that position	
Certification(s)	
E-mail Address:	
Science Curriculum/textbook used for instruct	tion
Participation on other district and statewide to curriculum committee, school improvement team	eams (e.g. Science GSE development team, district a, peer review team

Question #1: Clarity of GSE

Is the GSE articulated in a way that it is clear what is expected of classroom instruction/curriculum and state assessment? (Do I understand what learning will be assessed on the state assessment and the related curricular and/or instructional aspects?) If not, what aspect of the GLE needs further clarification? (E.g. clarify terminology, give examples, etc.)

LS1 - All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species).

LSI (9-11) INQ+SAE+FAF -1 Use data and observe	(9-11) INQ+SAE+FAF -1 Use data and observation to make connections			
between, to explain, or to justify how specific cell or	tween, to explain, or to justify how specific cell organelles produce/regulate			
what the cell needs or what a unicellular or multi-ce	hat the cell needs or what a unicellular or multi-cellular organism needs for			
survival (e.g., protein synthesis, DNA-replication, ne	survival (e.g., protein synthesis, DNA-replication, nerve cells)			
GSEs	Curriculum/	State		
	Instruction	Assessment		
LS1 (9-11)- 1a explaining the relationships	0	0		
LS1 (9-11)- 1b explaining that most multi-	0	0		
cellular	0	0		

LSI (9-11) FAF+ POC -2 Explain or justify with evidence how the alteration of the DNA sequence may produce new gene combinations that make little difference, enhance capabilities, or can be harmful to the organism (e.g., selective breeding, genetic engineering, mutations).

GSEs	Curriculum/ Instruction	State Assessment
LS1 (9-11) - 2a describing the DNA structure	0	0
LS1 (9-11) - 2b explaining how DNA may	0	0
LS1 (9-11) - 2c describing how DNA contains	0	0

LS2 - Matter cycles and energy flows through an ecosystem.

LS2 (9-11) INQ+SAE -3 Using data from a specific ecosystem, explain relationships or make predictions about how environmental disturbance (human impact or natural events) affects the flow of energy or cycling of matter in an ecosystem.

GSEs	Curriculum/ Instruction	State Assessment	
LS2 (9-11)-3a defining and giving an example	0	0	l
LS2 (9-11)-3b describing ways in which	0	0	l
LS2 (9-11)-3c describing ways in which natural	0	0	l
			_

Comments

Comments

Question # 1: Clarity of GSE Is the GSE articulated in a way that it is clear what is expected of classroom instruction/curriculum and state assessment? (Do I understand what learning will be assessed on the state assessment and the related						
			the GLE needs further clarification? (E.g. clarify			
LS2 - Matter cycles and energy flow	s through a	n ecosyster	n.			
LS2 (9-11) POC+ SAE -4 Trace the cycling of matt flow of energy in a living system from its source thr cellular, biochemical processes (e.g., photosynthesis	ough its transfo	Comments				
GSEs	Curriculum/ Instruction	State Assessment				
LS2 (9-11)— 4a diagramming the energy flow LS2 (9-11)— 4b explaining how the chemical	0	0				
LS2 (9-11) NOS -5 Explain or evaluate potential bid interpreted in reports concerning a particular environment the biology of humans		Comments				
GSEs	Curriculum/ Instruction	State Assessment				
LS2 (9-11) –5a analyzing claims from LS2 (9-11) –5b making appropriate adjustments	0	o o				
LS3 - Groups of organisms show evi	dence of ch	ange over t	ime (structures, behaviors, and biochemistry).			
LS3 (9-11) NOS -6 Explain how evidence from tech or refutes the genetic relationships among groups of analysis, protein analysis.			Comments			
GSEs	Curriculum/ Instruction	State Assessment				
LS3 (9-11)- 6a using data (e.g. diagrams, charts	o	O				
LS3 (9-11) INQ POC-7 Given a scenario, provide et how sexual reproduction results in a great variety of and contributes to natural selection (e.g., Darwin's Tay Sach's disease).	f possible gene d	combinations	Comments			
GSEs	Curriculum/ Instruction	State Assessment				
LS3 (9-11) –7a investigating how information	0	0				
LS3 (9-11) –7b investigating how the sorting LS3 (9-11) –7c citing evidence of how natural	0	0				
LS3 (9-11) INQ FAF+POC -8 Given information about living or extinct organisms, cite evidence to explain the frequency of inherited characteristics of organisms in a population, OR explain the evolution of varied structures (with defined functions) that affected the organisms' survival in a specific environment						
organisms, cite evidence to explain the frequency of i organisms in a population, OR explain the evolution defined functions) that affected the organisms' surviv	inherited charac of varied structu	teristics of ures (with	Comments			
organisms, cite evidence to explain the frequency of it organisms in a population, OR explain the evolution	inherited charac of varied structu	teristics of ures (with	Comments			

Question #1: Clarity of GSE

Is the GSE articulated in a way that it is clear what is expected of classroom instruction/curriculum and state assessment? (Do I understand what learning will be assessed on the state assessment and the related curricular and/or instructional aspects?) If not, what aspect of the GLE needs further clarification? (E.g. clarify terminology, give examples, etc.)

(E.g. clarify terminology, give examples, etc.)						
LS4 - Humans are similar to other sp	pecies in ma	any ways, a	nd yet are unique among Earth's life forms.			
LS4 (9-11) NOS+INQ -9 Use evidence to make and the ways that humans or other organisms are affect or heredity (e.g., pathogens, diseases, medical advan	ed by environme	ental factors	Comments			
GSEs	Curriculum/	State				
	Instruction	Assessment				
LS4 (9-11) –9a researching scientific	0	0				
LS4 (9-11) –9b providing an explanation of	0	0				
LS4 (9-11) SAE+FAF -10 Explain how the immunatervous system works-and draw conclusions about him aintain homeostasis in the human body.	•	Comments				
GSEs	Curriculum/ Instruction	State Assessment				
LS4 (9-11)-10a explaining how the roles of the	0	0				
LS4 (9-11)-10b investigating the factors that	0	0				

Question #2: Clarity of Grade Span Differences Are the differences between the GSEs of adjacent grade spans clear? They should show the appropriate developmental growth as they progress K - high school. NOTE: In some cases, no differences are articulated between the adjacent (corresponding) GSEs. This may be due to increasing difficulty in some related GSE. LS1 - All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species). Comments LS1 (9-11) INO+SAE+FAF -1 Use data and observation to make connections between, to explain, or to justify how specific cell organelles produce/regulate what the cell needs or what a unicellular or multi-cellular organism needs for survival (e.g., protein synthesis, DNA-replication, nerve cells) GSEs Differences Differences are clear not clear LS1 (9-11)- 1a explaining the relationships... 0 LS1 (9-11)- 1b explaining that most multicellular... 0 0 LS1 (9-11)- 1c comparing the role of various... Comments LSI (9-11) FAF+ POC -2 Explain or justify with evidence how the alteration of the DNA sequence may produce new gene combinations that make little difference, enhance capabilities, or can be harmful to the organism (e.g., selective breeding, genetic engineering, mutations) **GSEs** Differences Differences are clear not clear LS1 (9-11) –2a describing the DNA structure... LS1 (9-11) -2b explaining how DNA may be ... 0 LS1 (9-11) -2c describing how DNA contains ... 0 0 LS2 - Matter cycles and energy flows through an ecosystem. Comments LS2 (9-11) INQ+SAE -3 Using data from a specific ecosystem, explain relationships or make predictions about how environmental disturbance (human impact or natural events) affects the flow of energy or cycling of matter in an ecosystem. **GSEs** Differences Differences not clear LS2 (9-11)-3a defining and giving an example... LS2 (9-11)-3b describing ways in which... 0 0 LS2 (9-11)-3c describing ways in which natural... Comments LS2 (9-11) POC+ SAE -4 Trace the cycling of matter (e.g., carbon cycle) and the flow of energy in a living system from its source through its transformation in cellular, biochemical processes (e.g., photosynthesis, cellular respiration, fermentation)

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Differences

are clear

0

Differences

not clear

GSEs

LS2 (9-11)- 4a diagramming the energy flow...

LS2 (9-11) - 4b explaining how the chemical...

Question #2: Clarity of Grade Span Differences Are the differences between the GSEs of adjacent grade spans clear? They should show the appropriate developmental growth as they progress K - high school. NOTE: In some cases, no differences are articulated between the adjacent (corresponding) GSEs. This may be due to increasing difficulty in some related GSE. LS2 - Matter cycles and energy flows through an ecosystem. Comments LS2 (9-11) NOS -5 Explain or evaluate potential bias in how evidence is interpreted in reports concerning a particular environmental factor that impacts the biology of humans. **GSEs** Differences Differences are clear not clear LS2 (9-11) -5a analyzing claims from... LS2 (9-11) -5b making appropriate adjustments... 0 0 LS3 Groups of organisms show evidence of change over time (structures, behaviors, and biochemistry). Comments LS3 (9-11) NOS -6 Explain how evidence from technological advances supports or refutes the genetic relationships among groups of organisms (e.g., DNA analysis, protein analysis. Differences Differences are clear not clear LS3 (9-11)- 6a using data (e.g. diagrams, charts ... Comments LS3 (9-11) INQ POC-7 Given a scenario, provide evidence that demonstrates how sexual reproduction results in a great variety of possible gene combinations and contributes to natural selection (e.g., Darwin's finches, isolation of a species, Tay Sach's disease). **GSEs** Differences Differences are clear not clear LS3 (9-11) -7a investigating how information... LS3 (9-11) -7b investigating how the sorting ... 0 0 LS3 (9-11) -7c citing evidence of how natural ... 0 0 Comments LS3 (9-11) INQ FAF+POC -8 Given information about living or extinct organisms, cite evidence to explain the frequency of inherited characteristics of organisms in a population, OR explain the evolution of varied structures (with defined functions) that affected the organisms' survival in a specific environment (e.g., giraffe, wind pollination of flowers). Differences Differences are clear not clear LS3 (9-11) -8a illustrating that when an... 0 LS3 (9-11) -8b distinguish between... 0 0 LS3 (9-11) -8c recognizing patterns in... 0 0

0

0

LS3 (9-11) -8d using data or models (charts,...

Question # 2: Clarity of Grade Span Differences

Are the differences between the \overline{GSEs} of adjacent grade spans clear? They should show the appropriate developmental growth as they progress K - high school.

NOTE: In some cases, no differences are articulated between the adjacent (corresponding) GSEs. This may be due to increasing difficulty in some related GSE.

LS4 - Humans are similar to other species in many ways, and yet are unique among Earth's life forms.

LS4 (9-11) NOS+INQ -9 Use evidence to make and the ways that humans or other organisms are affec			
or heredity (e.g., pathogens, diseases, medical adva	•		
GSEs	Differences are clear	Differences not clear	
LS4 (9-11) –9a researching scientific	0	0	
LS4 (9-11) –9b providing an explanation of	0	0	
		0	Comments
LS4 (9-11) SAE+FAF -10 Explain how the immun nervous system works-and draw conclusions about			Comments
LS4 (9-11) SAE+FAF -10 Explain how the immun nervous system works-and draw conclusions about maintain homeostasis in the human body.	how systems inte	Differences	Comments
LS4 (9-11) SAE+FAF -10 Explain how the immun nervous system works-and draw conclusions about maintain homeostasis in the human body.	Differences are clear	Differences not clear	Comments
LS4 (9-11) SAE+FAF -10 Explain how the immun nervous system works-and draw conclusions about maintain homeostasis in the human body. GSEs LS4 (9-11)-10a explaining how the roles of the LS4 (9-11)-10b investigating the factors that	how systems inte	Differences	Comments

Question 3: Expected Rigor Is the GSE more rigorous, similar science program at that grade spa		less rigo	rous tha	an what is presently expected in your school's
LS1 - All living organisms have identifications, & species).	tifiable s	tructure	es and cha	aracteristics that allow for survival (organisms,
LSI (9-11) INQ+SAE+FAF -1 Use data and observed between, to explain, or to justify how specific cell or the cell needs or what a unicellular or multi-cellula (e.g., protein synthesis, DNA-replication, nerve cells	ganelles pro r organism	oduce/regula	ate what	Comments
GSEs	More	As	Less	
Y C1 (0.11) 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Rigorous	Rigorous	Rigorous	
LS1 (9-11)- 1a explaining the relationships LS1 (9-11)- 1b explaining that most multicellular	0	0	0	
LS1 (9-11)- 1c comparing that most muticential	0	0	0	
201 (7 11) Te companing the role of various				
LS1 (9-11) FAF+ POC -2 Explain or justify with evi	dence how t	he alteration	n of the	Comments
DNA sequence may produce new gene combinations capabilities, or can be harmful to the organism (e.g., engineering, mutations)	that make li	ttle differenc	e, enhance	
GSEs	More	As	Less	
LS1 (9-11) –2a describing the DNA structure	Rigorous	Rigorous	Rigorous	
LS1 (9-11) –2a describing the DNA structure LS1 (9-11) –2b explaining how DNA may be	0	0	0	
LS1 (9-11) –2c describing how DNA contains	0	0	0	
LS2 - Matter cycles and energy flows	s throug	h an eco	system.	
LS2 (9-11) INQ+SAE -3 Using data from a specific or make predictions about how environmental distunct events) affects the flow of energy or cycling of matte	rbance (hun	nan impact (-	Comments
GSEs	More Rigorous	As Rigorous	Less Rigorous	
LS2 (9-11)-3a defining and giving an example	0	0	0	
LS2 (9-11)-3b describing ways in which	0	0	0	
LS2 (9-11)-3c describing ways in which natural	0	0	0	
			0	
LS2 (9-11) POC+ SAE –4Trace the cycling of matte of energy in a living system from its source through biochemical processes (e.g., photosynthesis, cellular	its transfor	mation in ce	ellular,	Comments
GSEs	More Rigorous	As Rigorous	Less Rigorous	
LS2 (9-11)– 4a diagramming the energy flow	o	o	o	
102 (7-11)— 7a diagramming the energy now	0	1		

Question 3: Expected Rigor Is the GSE more rigorous, similar science program at that grade spa		less rigo	rous tha	an what is presently expected in your school's
LS2 - Matter cycles and energy flow		h an eco	system.	
LS2 (9-11) NOS –5 Explain or evaluate potential bi in reports concerning a particular environmental fa humans		Comments		
GSEs	More Rigorous	As Rigorous	Less Rigorous	
LS2 (9-11) –5a analyzing <u>claims from</u> LS2 (9-11) –5b <u>making appropriate adjustments</u>	0	0	0	
LS3 - Groups of organisms show evi	dence of	change	over tim	e (structures, behaviors, and biochemistry).
LS3 (9-11) NOS –6 Explain how evidence from tech refutes the genetic relationships among groups of o protein analysis.				Comments
GSEs	More Rigorous	As Rigorous	Less Rigorous	
LS3 (9-11)- 6a <u>using data (e.g. diagrams, charts</u>	O	O	O	
LS3 (9-11) INQ POC-7 Given a scenario, provide es sexual reproduction results in a great variety of pos contributes to natural selection (e.g., Darwin's finct Sach's disease).	sible gene c	Comments		
GSEs	More Rigorous	As Rigorous	Less Rigorous	
LS3 (9-11) –7a investigating how information LS3 (9-11) –7b investigating how the sorting LS3 (9-11) –7c citing evidence of how natural	0 0	0 0	0 0	
LS3 (9-11) INQ FAF+POC -8 Given information all cite evidence to explain the frequency of inherited ch population, OR explain the evolution of varied struct affected the organisms' survival in a specific environ pollination of flowers).	aracteristics ures (with de	of organism efined functi	ıs in a	Comments
GSEs	More Rigorous	As Rigorous	Less Rigorous	
LS3 (9-11) -8a illustrating that when an	0	0	0	
LS3 (9-11) -8b distinguish between LS3 (9-11) -8c recognizing patterns in	0	0	0	
LS3 (9-11) -8d using data or models (charts,	0	0	0	
LS4 - Humans are similar to other s	pecies in	many w	ays, and	yet are unique among Earth's life forms.
LS4 (9-11) NOS+INQ -9 Use evidence to make and ways that humans or other organisms are affected be heredity (e.g., pathogens, diseases, medical advance GSEs	y environm	ental factors	s or	Comments
LS4 (9-11) –9a researching scientific LS4 (9-11) –9b providing an explanation of	0	0	0 0	
LS4 (9-11) SAE+FAF -10 Explain how the immun nervous system work s a nd draw conclusions about t homeostasis in the human body.		-		Comments
GSEs	More Rigorous	As Rigorous	Less Rigorous	
LS4 (9-11)-10a explaining how the roles of the	o	o	o	

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Question # 4: Does the set of GSEs within each Statement of Enduring Knowledge have the potential to promote coherent instruction? First, is each individual GSE coherent with the Statement of Enduring Knowledge under which it is listed? Second, as a whole, do these GSEs articulate well-balanced coverage of the major concepts within the EK statement? How could they be improved? Go back and review ALL the GSEs within the Statement of Enduring Knowledge looking at them as a "GSE set." Does the set of GSEs within this statement of enduring knowledge have the potential to promote coherent instruction?

LS1 - All living organisms have ident	aracteristics	GSEs fo	or this EK Statem	aent cohe	rent as a set		
that allow for survival (organisms, p			11 40001 12000	Yes	0	No	0
that anow for survivar (or sumbine, p	opulations, c	e species).		165	U	110	J
LS1 (9-11) INQ+SAE+FAF -1 Use data and observed between, to explain, or to justify how specific cell org the cell needs or what a unicellular or multi-cellular (e.g., protein synthesis, DNA-replication, nerve cells		(Comments				
(e.g., protein symmests, D11A-reputation, nerve cons	,	l	I				ŀ
GSEs	Individual cohe		I				
		uring Knowledge	I				I
TC1 (0.11) In appleiring the relationships	Yes	No	I				I
LS1 (9-11)- 1a explaining the relationships LS1 (9-11)- 1b explaining that most multicellular	0	0	I				I
LS1 (9-11)- 16 explaining that most multicentular LS1 (9-11)- 1c comparing the role of various	0	0	I				I
LSI (3-11)- 16 companing the role of various			I				ŀ
			I				ŀ
			I				ŀ
LS1 (9-11) FAF+ POC -2 Explain or justify with evid	dence how the alte	ration of the	I	(Comments		ŀ
DNA sequence may produce new gene combinations to			I				
capabilities, or can be harmful to the organism (e.g.,	selective breeding	;, genetic	I				
engineering, mutations)			I				I
GSEs	Individual coh	erence with the	I				
GSES		uring Knowledge	I				
	Yes	No	I				
LS1 (9-11) –2a describing the DNA structure	0	0	I				I
LS1 (9-11) –2b explaining how DNA may be	0	0	I				
LS1 (9-11) –2c describing how DNA contains	0	0	I				I
-			I				
	ı l	1	I				
Y CA 3.5 (1 1 1 0	-11			CCEs fo	or this EK Statem	- ant ook	
LS2 - Matter cycles and energy flows	s through an	ecosystem.		Yes		No No	
					0	NO	0
LS2 (9-11) INQ+SAE -3 Using data from a specific	ecosystem, explai	n relationships	I	(Comments		
or make predictions about how environmental distur		•	I				
events) affects the flow of energy or cycling of matte		-	I				
GSEs		erence with the	I				
GDES		luring Knowledge	I				
	Yes	No	I				
LS2 (9-11)-3a defining and giving an example	0	0	I				
LS2 (9-11)-3b describing ways in which	0	0	I				
LS2 (9-11)-3c describing ways in which natural	0	0	I				
	į l	į l	I				
					~		
LS2 (9-11) POC+ SAE -4Trace the cycling of matter			I	(Comments		
of energy in a living system from its source through	its transformation	ı in cellular,	I				
biochemical processes (e.g., photosynthesis, cellular	respiration, ferme	entation)	I				
GSEs	Individual cohe	erence with the	I				
		luring Knowledge	I				
	Yes	No	I				
LS2 (9-11) – 4a diagramming the energy flow	0	0	I				
LS2 (9-11)– 4b explaining how the chemical	0	0	I				
	1	1	I				

Question # 4: Does the set of GSEs within each Statement of Enduring Knowledge have the potential

to promote coherent instruction? First, is each individual GSE coherent with the Statement of Enduring Knowledge under which it is listed? Second, as a whole, do these GSEs articulate wellbalanced coverage of the major concepts within the EK statement? How could they be improved? Go back and review ALL the GSEs within the Statement of Enduring Knowledge looking at them as a "GSE set." Does the set of GSEs within this statement of enduring knowledge have the potential to promote coherent instruction? GSEs for this EK Statement coherent as a set LS2 - Matter cycles and energy flows through an ecosystem. see section above LS2 (9-11) NOS -5 Explain or evaluate potential bias in how evidence is interpreted in reports concerning a particular environmental factor that impacts the biology of humans GSEs Individual coherence with the Statement of Enduring Knowledge YesNo LS2 (9-11) -5a analyzing claims from... 0 0 LS2 (9-11) -5b making appropriate adjustments... Ο GSEs for this EK Statement coherent as a set LS3 Groups of organisms show evidence of change over time (structures, behaviors, and biochemistry). Yes No Comments LS3 (9-11) NOS -6 Explain how evidence from technological advances supports or refutes the genetic relationships among groups of organisms (e.g., DNA analysis, protein analysis. GSEs Individual coherence with the Statement of Enduring Knowledge Yes No LS3 (9-11)- 6a using data (e.g. diagrams, charts ... Comments LS3 (9-11) INQ POC-7 Given a scenario, provide evidence that demonstrates how sexual reproduction results in a great variety of possible gene combinations and contributes to natural selection (e.g., Darwin's finches, isolation of a species, Tay Sach's disease). GSEs Individual coherence with the Statement of Enduring Knowledge LS3 (9-11) –7a investigating how information ... 0 LS3 (9-11) –7b investigating how the sorting ... 0 0 LS3 (9-11) -7c citing evidence of how natural ... 0 Comments LS3 (9-11) INQ FAF+POC -8 Given information about living or extinct organisms, cite evidence to explain the frequency of inherited characteristics of organisms in a population, OR explain the evolution of varied structures (with defined functions) that affected the organisms' survival in a specific environment (e.g., giraffe, wind pollination of flowers). Individual coherence with the Statement of Enduring Knowledge Yes No LS3 (9-11) -8a illustrating that when an... 0 LS3 (9-11) -8b distinguishing between... 0 0 LS3 (9-11) -8c recognizing patterns in... 0 0 LS3 (9-11) -8d using data or models (charts,... 0 0

Question # 4: Does the set of GSEs within each Statement of Enduring Knowledge have the potential to promote coherent instruction? First, is each individual GSE coherent with the Statement of Enduring Knowledge under which it is listed? Second, as a whole, do these GSEs articulate well-balanced coverage of the major concepts within the EK statement? How could they be improved? Go back and review ALL the GSEs within the Statement of Enduring Knowledge looking at them as a "GSE set." Does the set of GSEs within this statement of enduring knowledge have the potential to promote coherent instruction?

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LS4 - Humans are similar to other sp	yet are	GSEs for	this EK State	ment cohe	rent as a set			
unique among Earth's life forms.		Yes	0	No	0			
LS4 (9-11) NOS+INQ -9 Use evidence to make and ways that humans or other organisms are affected by heredity (e.g., pathogens, diseases, medical advances		C	omments					
GSEs		erence with the uring Knowledge						
	Yes	No						
LS4 (9-11) –9a researching scientific	0	0						
LS4 (9-11) –9b providing an explanation of	0	0						
LS4 (9-11) SAE+FAF -10 Explain how the immune nervous system works-and draw conclusions about homeostasis in the human body.	• .	• /		C	comments			
GSEs		erence with the						
	Statement of End	uring Knowledge No						
LS4 (9-11)-10a explaining how the roles of the								
LS4 (9-11)-10b investigating the factors that	0	0						
	Ŭ	Ü						

Question #1: Clarity of GSE

PS1 (9-11)-4a comparing the characteristics...
PS1 (9-11)-4b writing formulae for compounds...
PS1 (9-11)-4c explaining and/or modeling...

Is the GSE articulated in a way that it is clear what is expected of classroom instruction/curriculum and state assessment? (Do I understand what learning will be assessed on the state assessment and the related curricular and/or instructional aspects?) If not, what aspect of the GLE needs further clarification? (E.g. clarify terminology, give examples, etc.)

PS1 - All living and nonliving things are composed of matter having characteristic properties that distinguish

one substance from another (independent of size or amount of substance)

Instruction

PS1 (9-11) INQ -1 Use physical and chemical properties as determined			Comments
through an investigation to identify a substance. GSEs	Curriculum/ Instruction	State Assessment	
PS1 (9-11) –1a utilizing appropriate data PS1 (9-11) –1b determining the pressure	0	0	
PSI (9-11) MAS+ NOS -2 Scientific thought about atoms has changed over time. Using information (narratives or models of atoms) provided, cite evidence that has changed our understanding of the atom and the development of atomic theory.			Comments
GSEs PS1 (9-11)-2a given appropriate prompts	Curriculum/ Instruction	State Assessment	
(diagrams, charts, narratives, etc.) students	0	0	
PS1 (9-11) POC -3 Explain how properties of ele elements on the periodic table are related	ements and the l	ocation of	Comments
GSEs	Curriculum/ Instruction	State Assessment	
PS1 (9-11)-3a identifying and explaining the PS1 (9-11)-3b predicting the relative physical	0	0	
PSI (9-11) MAS+ FAF – 4 Model and explain the explain how an atom's electron configuration, pare electron(s), determines how that atom can interact	ticularly the out	termost	Comments
GSEs	Curriculum/	State	

PS2 - Energy is necessary for change to occur in matter. Energy can be stored, transferred, and transformed, but cannot be destroyed.

Assessment

0

PS2 (9-11) POC+SAE-5 Demonstrate how transfor	rmations of ene	rgy produce	Comments			
some energy in the form of heat and therefore the	efficiency of the	system is				
reduced (chemical, biological, and and physical sy	stems).	•				
GSEs	Curriculum/ Instruction	State Assessment				
PS2 (9-11)-5a describing or diagraming	0	0				
	0	0				
PS2 (9-11) INO+SAE -6 Using information provid	ed about chemi	cal changes.	Comments			
PS2 (9-11) INQ+SAE -6 Using information provid draw conclusions about and explain the energy flo reaction (e.g., exothermic reactions, endothermic r	w in a given cho		Comments			
draw conclusions about and explain the energy flo	w in a given cho		Comments			
draw conclusions about and explain the energy flo reaction (e.g., exothermic reactions, endothermic r	w in a given che eactions)	emical	Comments			
draw conclusions about and explain the energy flo reaction (e.g., exothermic reactions, endothermic r	w in a given cho eactions) Curriculum/	emical State	Comments			
draw conclusions about and explain the energy flo reaction (e.g., exothermic reactions, endothermic r GSEs	w in a given che eactions) Curriculum/ Instruction	State Assessment	Comments			
draw conclusions about and explain the energy flo reaction (e.g., exothermic reactions, endothermic r GSEs PS2 (9-11)-6a writing simple balanced	w in a given cha eactions) Curriculum/ Instruction	State Assessment	Comments			
draw conclusions about and explain the energy flo reaction (e.g., exothermic reactions, endothermic r GSEs PS2 (9-11)-6a writing simple balanced PS2 (9-11)-6b identifying whether a given	w in a given chareactions) Curriculum/ Instruction	State Assessment o	Comments			
draw conclusions about and explain the energy floreaction (e.g., exothermic reactions, endothermic r GSEs PS2 (9-11)-6a writing simple balanced PS2 (9-11)-6b identifying whether a given PS2 (9-11)-6c explaining and/or modeling	w in a given che eactions) Curriculum/ Instruction	State Assessment	Comments			

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Question #1: Clarity of GSE

PS3 (9-11)–10b comparing and contrasting...
PS3 (9-11)–10c qualifying the relationship...

Is the GSE articulated in a way that it is clear what is expected of classroom instruction/curriculum and state assessment? (Do I understand what learning will be assessed on the state assessment and the related curricular and/or instructional aspects?) If not, what aspect of the GLE needs further clarification? (E.g. clarify terminology, give examples, etc.)

PS 2 - Energy is necessary for change to occur in matter. Energy can be stored, transferred, and transformed, but cannot be destroyed.

cannot be destroyed.			
PS2 (9-11) –SAE – 7 Explain relationships between	ı and among ele	ctric charges,	Comments
magnetic fields, electromagnetic forces, and atomic	particles.		
GSEs	Curriculum/	State	
	Instruction	Assessment	
PS2 (9-11)-7a explaining through words	0	0	
PS2 (9-11)-7b explaining through words	0	0	
PS2 (9-11)-7c describing the relationship	0	0	
PS3 - The motion of an object is affe	ected by for	ces.	-
PS3 (9-11) POC+ INQ 8 Given information (e.g., §	eranhs data dia	grams) use	Comments
the relationships between or among force, mass, vel			
acceleration to predict and explain the motion of ob		,	
GSEs	Curriculum/	State	
GSES	Instruction	Assessment	
PS3 (9-11)-8a predicting and/or graphing			
PS3 (9-11)-8b using modeling, illustrating	0	0	
155 (5-11)-66 dsing modering, mustrating	0	0	
PS3 (9-11) POC -9 Apply the concepts of inertia,	motion and mo	mentum to	Comments
predict and explain situations involving forces and			
objects and collisions.	,		
GSEs	Curriculum/	State	
3525	Instruction	Assessment	
PS3 (9-11)-9a explaining through words, charts	0	0	
PS3 (9-11)-9b using Newton's Laws of Motion	0	0	
150 (5 11) 50 using Hewton 5 Daws of	_	_	
PS3 (9-11) SAE -10 Explain the effects on wavele	ength and freque	ency as	Comments
electromagnetic waves interact with matter (e.g., lig			
GSEs	Curriculum/	State	
GDES	Instruction	Assessment	
PS3 (9-11)–10a investigating examples of wave	0	0	
DC2 (0.11) 10b comparing and contracting	_	-	

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Question # 2: Clarity of Grade Span Differences

PS2 (9-11)-6e differentiating between fission...

Are the differences between the GSEs of adjacent grade spans clear? They should show the appropriate developmental growth as they progress K - high school.

NOTE: In some cases, no differences are articulated between the adjacent (corresponding) GSEs. This may be due to increasing difficulty in some related GSE.

PS1 - All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another (independent of size or amount of substance)

one substance in our amount (mark	011460116 01 81	20 01 01110	01 8 4 8 5 6 6 1 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6
PS1 (9-11) INQ -1 Use physical and chemical pr through an investigation to identify a substance	operties as deter	rmined	Comments
GSEs	Differences	Differences	
701 (0.11) 1	are clear	not clear	
PS1 (9-11) –1a utilizing appropriate data	0	0	
PS1 (9-11) –1b determining the pressure	Ü	Ü	
PS1 (9-11) MAS+ NOS -2 Scientific thought about	out atoms has cl	hanged over	Comments
time. Using information (narratives or models of a	itoms) provided,	cite evidence	
that has changed our understanding of the atom a	nd the developn	nent of	
atomic theory.	-		
GSEs	Differences	Differences	
PS1 (9-11)–2a given appropriate prompts	are clear	not clear	-
(diagrams, charts, narratives, etc.) students	0	0	
PSI (9-11) POC –3 Explain how properties of elements on the periodic table are related	ements and the l	location of	Comments
GSEs	Differences	Differences	1
	are clear	not clear	
PS1 (9-11)-3a identifying and explaining the	0	0	
PS1 (9-11)-3b predicting the relative physical	0	0	
PS1 (9-11) MAS+ FAF - 4 Model and explain th	e structure of a	n atom or	Comments
explain how an atom's electron configuration, par			
electron(s), determines how that atom can interact	t with other aton	ns	
GSEs	Differences	Differences	
0.25	are clear	not clear	
PS1 (9-11)-4a comparing the characteristics	0	0	
PS1 (9-11)-4b writing formulae for compounds	0	0	
PS1 (9-11)–4c Explaining and/or modeling	0	0	
DGA E · · · · · · · · · · · · · · · · · ·		• 44	
	ge to occur	ın matter.	Energy can be stored, transferred, and transformed, but
cannot be destroyed.			
PS2 (9-11) POC+SAE-5 Demonstrate how transfo	rmations of one	rav produce	Comments
some energy in the form of heat and therefore the	•	0	
reduced (chemical, biological, and and physical s		e system is	
GSEs	Differences	Differences	-
GSES	are clear	not clear	
PS2 (9-11)-5a describing or diagraming	0	0	
() - u <u> </u>			
PS2 (9-11) INQ+SAE -6 Using information provide	led about chemi	ical changes,	Comments
draw conclusions about and explain the energy flo			
reaction (e.g., exothermic reactions, endothermic	reactions)		
GSEs	Differences	Differences	
	are clear	not clear	
PS2 (9-11)-6a writing simple balanced	0	0	
PS2 (9-11)-6b identifying whether a given	0	0	
PS2 (9-11)-6c explaining and/or modeling	0	0	
PS2 (9-11)-6d explaining the concept of half	0	0	
	0		

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Question # 2: Clarity of Grade Span Differences

Are the differences between the GSEs of adjacent grade spans clear? They should show the appropriate developmental growth as they progress K - high school.

NOTE: In some cases, no differences are articulated between the adjacent (corresponding) GSEs. This may be due to increasing difficulty in some related GSE.

PS2 - Energy is necessary for change to occur in matter. Energy can be stored, transferred, and transformed, but cannot be destroyed.

PS2 (9-11) -SAE - 7 Explain relationships between magnetic fields, electromagnetic forces, and atomic	0	ctric charges,		
GSEs	Differences are clear	Differences not clear		
PS2 (9-11)-7a explaining through words	0	0		
PS2 (9-11)-7b explaining through words	0	0		
PS2 (9-11)-7c describing the relationship				

PS3 - The motion of an object is affected by forces.

PS3 (9-11) POC+ INQ 8 Given information (e.g., g the relationships between or among force, mass, velo acceleration to predict and explain the motion of obj.	ocity, momentum		Comments
GSEs	Differences are clear	Differences not clear	
PS3 (9-11)-8a predicting and/or graphing PS3 (9-11)-8b using modeling, illustrating	0	0	
PS3 (9-11) POC -9 Apply the concepts of inertia, r predict and explain situations involving forces and objects and collisions.			Comments
GSEs	Differences are clear	Differences not clear	
PS3 (9-11)-9a explaining through words, charts PS3 (9-11)-9b using Newton's Laws of Motion	0	0	
PS3 (9-11) SAE -10 Explain the effects on wavele electromagnetic waves interact with matter (e.g., lig			Comments
GSEs	Differences are clear	Differences not clear	
PS3 (9-11)–10a. investigating examples of wave	0	0	
PS3 (9-11)–10b <u>comparing and contrasting</u> PS3 (9-11)–10c <u>qualifying the relationship</u>	0	0	

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Question 3: Expected Rigor Is the GSE more rigorous, similar to, or less rigorous than what is presently expected in your school's science program at that grade span? PS1 - All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another (independent of size or amount of substance) Comments PS1 (9-11) INQ -1 Use physical and chemical properties as determined through an investigation to identify a substance **GSEs** More As Less Rigorous Rigorous Rigorous PS1 (9-11) -1a utilizing appropriate data... 0 0 0 PS1 (9-11) -1b determining the pressure ... 0 0 Comments PS1 (9-11) MAS+ NOS -2 Scientific thought about atoms has changed over time. Using information (narratives or models of atoms) provided, cite evidence that has changed our understanding of the atom and the development of atomic theory. More As Less **GSEs** PS1 (9-11)-2a given appropriate prompts Rigorous Rigorous Rigorous (diagrams, charts, narratives, etc.) students ... Comments PS1 (9-11) POC-3 Explain how properties of elements and the location of elements on the periodic table are related **GSEs** More As Less Rigorous Rigorous Rigorous PS1 (9-11)-3a identifying and explaining the... 0 0 PS1 (9-11)-3b predicting the relative physical... Comments PS1 (9-11) MAS+ FAF - 4 Model and explain the structure of an atom or explain how an atom's electron configuration, particularly the outermost electron(s), determines how that atom can interact with other atoms **GSEs** More As Less Rigorous Rigorous Rigorous 0 0 0 PS1 (9-11)-4a comparing the characteristics... PS1 (9-11)-4b writing formulae for compounds... 0 0 0 PS1 (9-11)-4c explaining and/or modeling... 0 0 PS2 - Energy is necessary for change to occur in matter. Energy can be stored, transferred, and transformed, but cannot be destroyed. Comments PS2 (9-11) POC+SAE-5 Demonstrate how transformations of energy produce some energy in the form of heat and therefore the efficiency of the system is reduced (chemical, biological, and and physical systems)

More

Rigorous

As

Rigorous

0

Less

Rigorous

0

GSEs

PS2 (9-11)-5a describing or diagraming...

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Question 3: Expected Rigor								
Is the GSE more rigorous, similar to, or less rigorous than what is presently expected in your school's								
science program at that grade span?								
PS2 - Energy is necessary for change to occur in matter. Energy can be stored, transferred, and transformed, but								
cannot be destroyed.								
PS2 (9-11) INQ+SAE -6 Using information provided conclusions about and explain the energy flow in exothermic reactions, endothermic reactions)		-		Comments				
GSEs	More	As	Less					
PS2 (9-11)-6a writing simple balanced	Rigorous	Rigorous	Rigorous					
PS2 (9-11)-6b identifying whether a given	0	0	0					
PS2 (9-11)-6c explaining and/or modeling	0	0	0					
PS2 (9-11)-6d explaining the concept of half	0	0	0					
PS2 (9-11)-6e differentiating between fission	0	0	0					
PS2 (9-11) –SAE – 7 Explain relationships betwee		electric charg	ges,	Comments				
magnetic fields, electromagnetic forces, and atomi	More	As	Less					
GSEs	Rigorous	Rigorous	Rigorous					
PS2 (9-11)-7a explaining through words	0	0	0					
PS2 (9-11)-7b explaining through words	0	0	0					
PS2 (9-11)-7c describing the relationship	0	0	0					
PS3 - The motion of an object is aff	ected by f	orces.	-					
PS3 (9-11) POC+ INQ 8 Given information (e.g.,	aranhs data	diagrams) us	so the	Comments				
relationships between or among force, mass, veloc								
predict and explain the motion of objects.		•						
GSEs	More Rigorous	As Rigorous	Less Rigorous					
PS3 (9-11)-8a predicting and/or graphing	Rigorous	Rigorous	Rigorous					
PS3 (9-11)-8b using modeling, illustrating	0	0	0					
155 (7-11)-66 using modering, musulating	0	0	0					
PS3 (9-11) POC -9 Apply the concepts of inertia,	motion, and n	nomentum to	predict and	Comments				
explain situations involving forces and motion, inc	luding station	ary objects ar	nd					
collisions.	1 37							
GSEs	More Rigorous	As Rigorous	Less Rigorous					
PS3 (9-11)-9a explaining through words, charts	o	o	o					
PS3 (9-11)-9a explaining through words, charts PS3 (9-11)-9b using Newton's Laws of Motion	0	0	0					
155 (2-11)-20 doing fromton 5 Laws or Motion								
DC2 (0.11) CAE 10 E. 1 : 4 CC 4	41 . 1 .		į.	Comments				
PS3 (9-11) SAE -10 Explain the effects on wavel electromagnetic waves interact with matter (e.g., li				Comments				
	-	-	т т					
GSEs	More	As	Less					
	Rigarane	Rigorone						
PS3 (9-11)_10a investigating evamples of wave	Rigorous	Rigorous	Rigorous					
PS3 (9-11)–10a. investigating examples of wave PS3 (9-11)–10b comparing and contrasting	0	0	0					
PS3 (9-11)–10a. investigating examples of wave PS3 (9-11)–10b comparing and contrasting PS3 (9-11)–10c qualifying the relationship								

Question # 4: Does the set of GSEs within each Statement of Enduring Knowledge have the potential to promote coherent instruction? First, is each individual GSE coherent with the Statement of Enduring

Knowledge under which it is listed? Second, as a whole, do these GSEs articulate well-balanced coverage of the major concepts within the EK statement? How could they be improved? Go back and review ALL the GSEs within the Statement of Enduring Knowledge looking at them as a "GSE set." Does the set of GSEs within this statement of enduring knowledge have the potential to promote coherent instruction? GSEs for this EK Statement coherent as a set PS1 - All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another Yes No (independent of size or amount of substance) Comments PS1 (9-11) INQ -1 Use physical and chemical properties as determined through an investigation to identify a substance **GSEs** Individual coherence with the Statement of Enduring Knowledge Yes No PS1 (9-11) -1a utilizing appropriate data... 0 0 0 0 PS1 (9-11) -1b determining the pressure ... Comments PS1 (9-11) MAS+ NOS-2 Scientific thought about atoms has changed over time. Using information (narratives or models of atoms) provided, cite evidence that has changed our understanding of the atom and the development of atomic theory. Individual coherence with the Statement of Enduring Knowledge Yes No PS1 (9-11)-2a given appropriate prompts (diagrams, charts, narratives, etc.) students Comments PS1 (9-11) POC-3 Explain how properties of elements and the location of elements on the periodic table are related Individual coherence with the Statement **GSEs** of Enduring Knowledge Yes PS1 (9-11)-3a identifying and explaining the... 0 PS1 (9-11)-3b predicting the relative physical... Comments PS1 (9-11) MAS+ FAF - 4 Model and explain the structure of an atom or explain how an atom's electron configuration, particularly the outermost electron(s), determines how that atom can interact with other atoms Individual coherence with the Statement GSEs of Enduring Knowledge PS1 (9-11)-4a comparing the characteristics... 0 0 PS1 (9-11)-4b writing formulae for compounds... 0 PS1 (9-11)-4c explaining and/or modeling... GSEs for this EK Statement coherent as a set PS2 - Energy is necessary for change to occur in matter. Energy can be stored, transferred, and transformed, but cannot be destroyed. Comments PS2 (9-11) POC+SAE-5 Demonstrate how transformations of energy produce some energy in the form of heat and therefore the efficiency of the system is reduced (chemical, biological, and and physical systems) Individual coherence with the Statement **GSEs** of Enduring Knowledge Yes No

0

PS2 (9-11)-5a describing or diagraming...

Question # 4: Does the set of GSEs within each Statement of Enduring Knowledge have the potential to promote coherent instruction? First, is each individual GSE coherent with the Statement of Enduring Knowledge under which it is listed? Second, as a whole, do these GSEs articulate well-balanced coverage of the major concepts within the EK statement? How could they be improved? Go back and review ALL the GSEs within the Statement of Enduring Knowledge looking at them as a "GSE set." Does

the set of GSEs within this statement of enduring knowledge have the potential to promote coherent instruction?

PS2 - Energy is necessary for change to oc	, GSEs for this EK Statement coherent as a set				
transferred, and transformed, but cannot	see section above				
PS2 (9-11) INQ+SAE -6 Using information provided about about and explain the energy flow in a given chemical reac endothermic reactions)	Comments				
GSEs	Individual coherence with the Statement of Enduring Knowledge				
	Yes	No			
PS2 (9-11)-6a writing simple balanced	0	0			
PS2 (9-11)-6b identifying whether a given	0	0			
PS2 (9-11)-6c explaining and/or modeling	0	0			
PS2 (9-11)-6d explaining the concept of half	0	0			
PS2 (9-11)-6e differentiating between fission	0	0			
PS2 (9-11) –SAE – 7 Explain relationships between and an	Comment				
electromagnetic forces, and atomic particles.					
GSEs	Es Individual coherence with the Statement of Enduring Knowledge				
PS2 (9-11)-7a explaining through words PS2 (9-11)-7b explaining through words	Yes	No			
PS2 (9-11)-7c describing the relationship					

PS 3 - The motion of an object is affected b	GSEs fo	GSEs for this EK Statement coherent as a set				
			Yes	0	No	0
PS3 (9-11) POC+ INQ 8 Given information (e.g., graphs, data between or among force, mass, velocity, momentum, and acceleration of objects.		Comment	ts			
GSEs		herence with the during Knowledge				
	Yes	No				
PS3 (9-11)-8a predicting and/or graphing	0	0				
PS3 (9-11)-8b using modeling, illustrating	0	0				
PS3 (9-11) POC -9 Apply the concepts of inertia, motion, an	id momentum to pr	edict and explain		Comment	ts	
situations involving forces and motion, including stationary of						
GSEs		herence with the				
	Statement of Enduring Knowledge					
	Yes	No				
PS3 (9-11)-9a explaining through words, charts	0	0				
PS3 (9-11)-9b using Newton's Laws of Motion	0	0				

Question # 4: Does the set of GSEs within each Statement of Enduring Knowledge have the potential to promote coherent instruction? First, is each individual GSE coherent with the Statement of Enduring Knowledge under which it is listed? Second, as a whole, do these GSEs articulate well-balanced coverage of the major concepts within the EK statement? How could they be improved?

Go back and review ALL the GSEs within the Statement of Enduring Knowledge looking at them as a "GSE set." Does the set of GSEs within this statement of enduring knowledge have the potential to promote coherent instruction?

PS 3 - The motion of an object is affected b		GSEs fo Yes	or this EK Stater	ment coherent as a set		
PS3 (9-11) SAE -10 Explain the effects on wavelength and frequency as electromagnetic waves interact with matter (e.g., light diffraction, blue sky)					Comments	
GSEs	Individual co Statement of En					
	Yes	No				
PS3 (9-11)–10a. investigating examples of	0	0				
PS3 (9-11)–10b comparing and contrasting	0					
PS3 (9-11)–10c qualifying the relationship	0	0				

Question #1: Clarity of GSE Is the GSE articulated in a way that it is clear what is expected of classroom instruction/curriculum and state assessment? (Do I understand what learning will be assessed on the state assessment and the related curricular and/or instructional aspects?) If not, what aspect of the GLE needs further clarification? (E.g. clarify terminology, give examples, etc.) ESS 1 - The earth and earth materials as we know them today have developed over long periods of time, through continual change processes. Comments ESS1 (9-11) POC-1 Provided with geologic data (including movement of plates) on a given locale, predict the likelihood for an earth event (e.g., volcanoes, mountain ranges, islands, earthquakes) **GSEs** Curriculum/ State Instruction Assessment ESS1 (9-11)-1a plotting the location of mountain... Comments ESS1 (9-11) NOS-2 Trace the development of the theory of plate tectonics or provide supporting geologic/geographic evidence that supports the validity of the theory of plate tectonics Curriculum/ State Instruction Assessment ESS1 (9-11)-2a using given data (diagrams, charts, narratives, etc.) to explain how scientific... Comments ESS1 (9-11) SAE+ POC-3 Explain how internal and external sources of heat (energy) fuel geologic processes (e.g., rock cycle, plate tectonics, sea floor spreading) **GSEs** Curriculum/ State Instruction Assessment ESS1 (9-11)-3a by explaining how heat (energy)... ESS1 (9-11)-3b explaining how convection... 0 0 0 ESS1 (9-11)-3c investigating and explaining... 0 0 ESS1 (9-11)-3d explaining how the physical... Comments ESS1 (9-11) INQ+POC+ MAS-4 Relate how geologic time is determined using various dating methods (e.g. radioactive decay, rock sequences, fossil records). **GSEs** Curriculum/ Instruction Assessment ESS1 (9-11)-4a comparing the usefulness... 0 ESS1 (9-11)-4b analyzing samples of rock... ESS3 - The origin and evolution of galaxies and the universe demonstrate fundamental principles of physical science across vast distances and time. Comments ESS3 (9-11) NOS-5 Explain how scientific theories about the structure of the universe have been advanced through the use of sophisticated technology (e.g., space probes; visual, radio and x-ray telescopes) **GSEs** Curriculum/ State Instruction Assessment ESS3 (9-11)-5a using appropriate prompts (diagrams, charts, narratives, etc.) students will... Comments

State

Assessment

ESS3 (9-11) NOS-6 Provide scientific evidence that supports or refutes the "Big

Curriculum/

Instruction

Bang" theory of how the universe was formed

ESS3 (9-11)-6a using data (diagrams, charts, narratives, etc.) to explain how the "Big Bang"...

GSEs

Question #2: Clarity of Grade Span Differences Are the differences between the GSEs of adjacent grade spans clear? They should show the appropriate developmental growth as they progress K - high school. NOTE: In some cases, no differences are articulated between the adjacent (corresponding) GSEs. This may be due to increasing difficulty in some related GSE. ESS1 - The earth and earth materials as we know them today have developed over long periods of time, through continual change processes. Comments ESS1 (9-11) POC-1 Provided with geologic data (including movement of plates) on a given locale, predict the likelihood for an earth event (e.g., volcanoes, mountain ranges, islands, earthquakes) GSEs Differences Differences are clear not clear ESS1 (9-11)-1a plotting the location of 0 mountain.. Comments ESS1 (9-11) NOS-2 Trace the development of the theory of plate tectonics or provide supporting geologic/geographic evidence that supports the validity of the theory of plate tectonics **GSEs** Differences are clear not clear ESS1 (9-11)-2a using given data (diagrams, charts, narratives, etc.) to explain how scientific... Comments ESS1 (9-11) SAE+ POC-3 Explain how internal and external sources of heat (energy) fuel geologic processes (e.g., rock cycle, plate tectonics, sea floor spreading) GSEs Differences Differences are clear not clear ESS1 (9-11)-3a by explaining how heat (energy)... ESS1 (9-11)-3b explaining how convection... 0 0 ESS1 (9-11)-3c investigating and explaining... 0 0 ESS1 (9-11)-3d explaining how the physical... 0 Comments ESS1 (9-11) INQ+POC+ MAS-4 Relate how geologic time is determined using various dating methods (e.g. radioactive decay, rock sequences, fossil records). Differences Differences are clear not clear ESS1 (9-11)-4a comparing the usefulness... 0 0 ESS1 (9-11)-4b analyzing samples of rock... ESS3 - The origin and evolution of galaxies and the universe demonstrate fundamental principles of physical science across vast distances and time Comments ESS3 (9-11) NOS-5 Explain how scientific theories about the structure of the universe have been advanced through the use of sophisticated technology (e.g., space probes; visual, radio and x-ray telescopes) GSEs Differences Differences

not clear ESS3 (9-11)-6a using data (diagrams, charts, 0 narratives, etc.) to explain how the "Big Bang" ...

Comments

not clear

Differences

are clear

Differences

are clear

ESS3 (9-11)-5a using appropriate prompts (diagrams, charts, narratives, etc.) students will ...

Bang" theory of how the universe was formed

ESS3 (9-11) NOS-6 Provide scientific evidence that supports or refutes the "Big

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Organian 2. Ermantal Discu				
Question 3: Expected Rigor	orto orl	ngg rigor o	uc thon v	what is presently expected in your school's
science program at that grade s		ess Hguru	ous man v	vitat is presently expected in your school's
• •		41	4 1 1	
	als as we k	now them	today hav	re developed over long periods of time, through
continual change processes.				_
ESS1 (9-11) POC-1 Provided with geologic date given locale, predict the likelihood for an earth evislands, earthquakes)				Comments
GSEs	More Rigorous	As Rigorous	Less Rigorous	
ESS1 (9-11)-1a. plotting the location of mountain	0	0	0	
ESS1 (9-11) NOS-2 Trace the development of the supporting geologic/geographic evidence that suptectonics				Comments
GSEs	More	As	Less	
ESS1 (9-11)-2a using given data (diagrams, charts, narratives, etc.) to explain how	Rigorous	Rigorous	Rigorous	
scientific				
				Comments
ESS1 (9-11) SAE+ POC-3 Explain how internal fuel geologic processes (e.g., rock cycle, plate tect			t (energy)	
GSEs	More Rigorous	As Rigorous	Less Rigorous	
ESS1 (9-11)-3a by explaining how heat	_	_	_	
ESS1 (9-11)-3b explaining how convection	0	0	0	
ESS1 (9-11)-3c investigating and explaining	0	0	0	
ESS1 (9-11)-3d explaining how the physical	0	0	О	
ESS1 (9-11) INQ+POC+ MAS—4 Relate how go	eologic time is	determined us	ing various	Comments
dating methods (e.g. radioactive decay, rock seque				
GSEs	More Rigorous	As Rigorous	Less Rigorous	
ESS1 (9-11)-4a comparing the usefulness	0	0	0	
ESS1 (9-11)-4b analyzing samples of rock	0	0	0	
ESS3 - The origin and evolution of	galaxies a	nd the uni	verse dem	onstrate fundamental principles of physical
science across vast distances and ti	me			
ESS3 (9-11) NOS-5 Explain how scientific the have been advanced through the use of sophistical				Comments
radio and x-ray telescopes)	More	As	Less	
GSEs	Rigorous	As Rigorous	Rigorous	
ESS3 (9-11)-5a using appropriate prompts				
(diagrams, charts, narratives, etc.) students will	0	0	0	
ESS3 (9-11) NOS-6 Provide scientific evidence theory of how the universe was formed	that supports of	r refutes the "	Big Bang"	Comments
GSEs	More	As	Less	
	Rigorous	Rigorous	Rigorous	
ESS3 (9-11)-6a using data (diagrams, charts, narratives, etc.) to explain how the "Big Bang"	0	0	0	

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Question #4: Does the set of GSEs within each Statement of Enduring Knowledge have the potential to promote coherent instruction? First, is each individual GSE coherent with the Statement of Enduring Knowledge under which it is listed? Second, as a whole, do these GSEs articulate well-balanced coverage of the major concepts within the EK statement? How could they be improved? Go back and review ALL the GSEs within the Statement of Enduring Knowledge looking at them as a "GSE set." Does the set of GSEs within this statement of enduring knowledge have the potential to promote coherent instruction? ESS 1 - The earth and earth materials as we know them today have GSEs for this EK Statement coherent as a set Yes No developed over long periods of time, through continual change processes. 0 ESSI (9-11) POC-1 Provided with geologic data (including movement of plates) on a Comments given locale, predict the likelihood for an earth event (e.g., volcanoes, mountain ranges, islands, earthquakes) Individual coherence within the GSEs Statement of Enduring Knowledge Yes No ESS1 (9-11)-1a plotting the location of mountain.. ESS1 (9-11) NOS-2 Trace the development of the theory of plate tectonics or provide Comments supporting geologic/geographic evidence that supports the validity of the theory of plate tectonics Individual coherence within the GSEs Statement of Enduring Knowledge ESS1 (9-11)-2a using given data (diagrams, Yes charts, narratives, etc.) to explain how scientific .. 0 0 Comments ESS1 (9-11) SAE+ POC-3 Explain how internal and external sources of heat (energy) fuel geologic processes (e.g., rock cycle, plate tectonics, sea floor spreading) Individual coherence within the Statement of Enduring Knowledge Yes No ESS1 (9-11)-3a by explaining how heat... 0 0 ESS1 (9-11)-3b explaining how convection... 0 Ω ESS1 (9-11)-3c investigating and explaining... 0 ESS1 (9-11)-3d explaining how the physical... 0 0 Comments ESS1 (9-11) INQ+POC+ MAS-4 Relate how geologic time is determined using various dating methods (e.g. radioactive decay, rock sequences, fossil records). Individual coherence within the GSEs Statement of Enduring Knowledge Yes No ESS1 (9-11)-4a comparing the usefulness... 0 ESS1 (9-11)-4b analyzing samples of rock... 0 0 GSEs for this EK Statement coherent as a set ESS3 - The origin and evolution of galaxies and the universe demonstrate fundamental principles of physical science across vast distances and time Yes No 0 0 Comments ESS3 (9-11) NOS-5 Explain how scientific theories about the structure of the universe have been advanced through the use of sophisticated technology (e.g., space probes; visual, radio and x-ray telescopes) Individual coherence within the GSEs Statement of Enduring Knowledge Yes No ESS3 (9-11)-5a using appropriate ... GSEs for this EK Statement coherent as a set ESS3 - The origin and evolution of galaxies and the universe demonstrate fundamental principles of physical science across vast distances and time Yes No Comments ESS3 (9-11) NOS-6 Provide scientific evidence that supports or refutes the "Big Bang" theory of how the universe was formed GSEs Individual coherence within the Statement of Enduring Knowledge

No

0

Yes

ESS3 (9-11)-6a using data (diagrams, charts, narratives, etc.) to explain how the "Big

Bang"

Question #5: What science content (important concepts) is missing in these draft science GSEs? Where are there gaps in content? This information is most essential for developing the science GSEs for local curriculum, instruction and assessment.						
Relevant EK (Identify by domain and number - ex. LS1)	Content/Concepts Needing Inclusion (Please provide as much detail as possible)					

Givens:

- GSEs in science are developed in grade spans K-2, 3-4, 5-6, 7-8 and high school.
- High school science GSEs for <u>all</u> students cover the content and skills eligible for the large-scale assessment given at the end of Grade 11.
- Examples of "Extensions" to the high school science GSEs are provided to guide the more in depth study of particular topic and for local curriculum and assessment
- The science GSEs are for state assessment and local curriculum and assessment purposes.
- The science GSEs are aligned with, but not necessarily limited by, existing state frameworks.

Purpose of GSE: The science GSEs are specified for a common, large-scale, state level assessment, and some are identified for local curriculum and assessment option.

Definition of a GSE: A science GSE is a stated objective that is aligned with the Rhode Island science framework and the national science standards, by grade span. A GSE differentiates performance on concepts, skills, or content knowledge between adjacent grade levels and spans, and as a set, leads to focused, coherent, and developmentally appropriate instruction without narrowing the curriculum

Criteria for the Development of GSEs:

- 1) GSEs in science **must** relate to national science standards, but not be limited by them.
- 2) GSEs should maintain a balance between a generalizable skill, concept, or piece of knowledge, **and** enough specificity to differentiate skill, concept, or knowledge between adjacent grades, to make it clear to teachers what is to be taught and learned, without being so specific that it narrows the curriculum.
- 3) GSEs should explicitly indicate cognitive demand (interaction of content and process). There should be a mix of cognitive demands at all grade levels, not an assumption that students in lower grades do less cognitively demanding work. (The verbs used in the construction of the science GSEs are consistent with the Webb's Depth of Knowledge (DOK) levels. Most science GSEs are written at DOK levels 2 and 3) see TABLE 1
- 4) GSEs should be specific and clear enough to know how they will be assessed.
- 5) GSEs should contain language that describes expected performance so that a student's achievement in relation to the GSE can be validly assessed for state assessment purposes.
 - a. **Not assessable** E.g., "Students demonstrate an understanding of characteristic properties of matter."
 - b. **Assessable** E.g., Students demonstrate an understanding of characteristic properties of matter by <u>citing evidence</u> (e.g., <u>prior knowledge</u>, <u>data</u>) to support conclusions about why objects are grouped/<u>not grouped together</u>

Rhode Island Grade Span Expectations K-12 in Science Field Review – High School Criteria for the Development of a *SET* of Grade Span Expectation in Science

- The set of GSEs should be of comparable grain size.
- Concepts, skills, and knowledge should be differentiated between adjacent grade spans.
- The set of GSEs within a domain of science (Life Science, Physical Science, Earth and Space Science) and the Statement of Enduring Knowledge reflects the relative importance as defined by a review of national and state science standards.
- The set of GSEs should promote coherent, focused, developmentally appropriate instruction, as opposed to isolated instruction *just* on topics, facts, or individual skills that need to be covered.
- The set of GSEs should be reasonable to learn adequately (assuming prior learning).
- The set of GSEs should be constructed as a continuum of learning. Success in one grade span should be a good predictor of success in the following year.
- Success on GSEs across multiple years should be a good predictor of performance at the national benchmark years. (i.e., NAEP).

TABLE 1 Sample Descriptors for each of the DOK Levels in Science, based on Webb (working draft K. Hess, updated September 2005)						
Level 1	Level 2	Level 3	Level 4			
Recall & Reproduction	Skills & Concepts	Strategic Thinking	Extended Thinking			
 a. Recall or recognize a fact, term, definition, simple procedure (such as one step), or property b. Demonstrate a rote response c. Use a well-known formula 	 a. Specify and explain the relationship between facts, terms, properties, or variables b. Describe and explain examples and non-examples of science concepts 	 a. Interpret information from a complex graph (such as determining features of the graph or aggregating data in the graph) b. Use reasoning, planning, and evidence 	 a. Select or devise approach among many alternatives to solve problem b. Based on provided data from a complex experiment that is novel to the student, deduct 			
d. Represent in words or diagrams a scientific concept or relationship e. Provide or recognize a standard scientific	c. Select a procedure according to specified criteria and perform it d. Formulate a routine	c. Explain thinking (beyond a simple explanation or using only a word or two to	the fundamental relationship between several controlled variables. c. Conduct an			
representation for simple phenomenon f. Perform a routine procedure, such as	problem given data and conditions e. Organize, represent, and	respond) d. Justify a response	investigation, from specifying a problem to designing and carrying out an experiment, to			
measuring length g. Perform a simple science process or a set procedure (like a recipe)	f. Make a decision as to how to approach the problem	e. Identify research questions and design investigations for a scientific problem	analyzing its data and forming conclusions d. Relate ideas <i>within</i> the			
h. Perform a clearly defined set of steps i. Identify, calculate, or	g. Classify, organize, or estimate	f. Use concepts to solve non-routine problems/more than one possible answer	e. Develop generalizations			
measure	h. Compare datai. Make observationsj. Interpret information	g. Develop a scientific model for a complex situation	of the results obtained and the strategies used and apply them to new problem situations			
	from a simple graph k. Collect and display data	h. Form conclusions from experimental or observational data				
		Complete a multi-step problem that involves planning and reasoning				
NOTE: If the knowledge	NOTE: If the knowledge	j. Provide an explanation of a principle	NOTE: Level 4 activities often require an extended			
necessary to answer an item automatically provides the answer, it is a Level 1.	necessary to answer an item does not automatically provide the answer, then the item is at least a Level 2.	k. Justify a response when more than one answer is possible	period of time for carrying out multiple steps; however, time alone is not			
	Most actions imply more than one step.	Cite evidence and develop a logical argument for concepts	a distinguishing factor if skills and concepts are simply repetitive over time.			
	NOTE: Level 3 is complex and abstract. If more than one response is possible, it	m. Conduct a designed investigation				
	is at least a Level 3 and calls for use of reasoning,	n. Research and explain a scientific concept				
	justification, evidence, as support for the response.	O. Explain phenomena in terms of concepts				